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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Paper No. —

Serial Number: 09/996,622
Filing Date: November 29, 2001
Appellant(s): Malcolm James Grieve et al.

Cantor Colburn LLP
For Appellant

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GROUP 1700

EXAMINER'S ANSWER

This is in response to appellant's brief on appeal filed October 19, 2004.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

This appeal involves claims 1-18.

Claims 19-26 are allowed.

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

Appellant's brief includes a statement that claims 1-18 do not stand or fall together and provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8).

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

The following is a listing of the prior art of record relied upon in the rejection of claims under appeal.

6,214,066 B1	Nataraj et al.	4-2001

(10) New Prior Art

No new prior art has been applied in this examiner's answer.

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the

appealed claims:

Claims 1-18 stand rejected under 35 U.S.C. 103 as obvious over Nataraj et al. Nataraj et al. disclose a process for operating a reformer system (see column 5, line 31 to column 13, line 7), and disclose at column 11, lines 48-51 that the local oxygen flux and the associated volume and activity of the catalyst must be matched to enable the endothermic reactions to proceed to an extent sufficient to keep the region from overheating. Nataraj et al. further disclose at column 12, lines 54-59 that the extent of carbon deposition in the reactor may be controlled by the reactant feed temperature, composition and constituents. It would be obvious from such disclosures of Nataraj et al. to increase a proportion of an oxidant in the gas mixture fed to the reformer system to obtain a temperature effective to remove carbon from the reformer system, since Nataraj et al. recognize that the temperature and concentration of oxygen in the reactant feed will affect the amount of carbon deposition and that overheating should be avoided. One of ordinary skill in the art would be motivated to avoid carbon deposition in the process of Nataraj et al., since it is well-known that carbon deposition poisons the catalyst.

(12) New Ground of Rejection

This examiner's answer does not contain any new ground of

rejection.

(11) Response to Argument

Appellant's argument, that Nataraj et al. is directed to a method of preventing carbon deposition in the reformer, but is silent on a method of removing any carbon deposited in the reformer, is not convincing. Nataraj et al. disclose reactions (7), (8) and (9) in column 11 in which the carbon is in equilibrium with CO, hydrogen and the hydrocarbon. It would be obvious from such reactions that carbon could be removed, as well as prevented from being formed, by controlling the reaction feed temperature, composition, and constituents, as suggested at column 12, lines 57-59 of Nataraj et al., since the carbon would react to form CO or the hydrocarbon, which would constitute a "removal" of carbon. Appellant's argument, that there is no teaching or suggestion in Nataraj et al. of increasing a proportion of an oxidant in the gas mixture with any reasonable expectation of success of increasing the temperature of the reformer to a temperature effective to remove contaminant, is not convincing. Nataraj et al. clearly teach at column 12, lines 57-59 and column 13, lines 4-7 that the presence of oxygen in the reactants and the reactant feed temperature affect the extent of carbon deposition. It would be obvious from such teachings that an increase in oxygen concentration in the reactants would cause

an increase in temperature, due to the exothermic reaction between the oxygen and the hydrocarbon. Accordingly it would not be unexpected that the steps recited in appellant's claim 1 would result in the prevention (or removal) of carbon in the reformer system. Moreover, Nataraj et al. teach at column 12, lines 60 and 61 that the presence of steam in the feed is beneficial for preventing carbon deposition. It would be obvious from such disclosure in Nataraj et al. to increase the proportion of steam in the gas mixture to remove the carbon from the reformer system, especially since reaction (7) in column 11 of Nataraj et al. suggests that any carbon would react with the steam to form hydrogen and carbon monoxide. It is noted that appealed claim 4 specifically recites that water may be one of the oxidants. It is further noted that the step of "reacting the gas mixture to form a reformate stream and to increase a temperature in the reformer system" recited in appeal claim 1 does not require that the increase in temperature be due to the reaction between the fuel and oxidant, but embraces a situation where the proportion of steam is increased in the gas mixture and the temperature in the reformer system is increased as a result of a different reaction, such as the exothermic reaction between oxygen and the fuel.

Regarding claims 2 and 9-17, appellant's argument, that

Nataraj et al. at least fail to teach or suggest controlling the flow rate of the gas mixture by monitoring a reformer system temperature; reducing the flow rate of the gas mixture when the temperature is greater than or equal to a first temperature; flowing the oxidant into the reformer system when the temperature is less than or equal to a second temperature; and reducing the flow rate of the oxidant when the temperature is greater than or equal to the first temperature, is not convincing. One of ordinary skill in the art would be motivated to operate the reformer system of Nataraj et al. at a substantially constant temperature. Since it is well-known that the reaction between a fuel and oxygen is exothermic and would therefore increase the temperature of the reformer system, one of ordinary skill in the art would appreciate that the flow rate of the gas mixture should be reduced and that the flow rate of the oxidant should be reduced when the temperature is greater than or equal to a first temperature in order to lower the temperature in the reformer system, and that oxidant should be flowed into the reformer system when the temperature is less than or equal to a second temperature in order to increase the temperature in the reformer system by the exothermic reaction between the fuel and the oxidant, so as to maintain the reformer system at a substantially constant temperature. Indeed, Nataraj et al. teach at column 11,

lines 40-51 that reactions (1), (2) and (3), which involve the reaction between methane and oxygen, are exothermic, suggesting that if the local oxygen flux is too high, and the endothermic reactions cannot kinetically keep up with the exothermic reactions, the region will overheat. One of ordinary skill in the art would be motivated from such disclosure in Nataraj et al. to regulate the amount of oxygen in the reformer system of Nataraj et al. to prevent overheating.

Regarding claim 3, appellant's argument, that Nataraj et al. fail to teach or suggest a process for operating a reformer system comprising, inter alia increasing a fuel to air equivalents ratio in the gas mixture and increasing the flow rate of the gas mixture to a peak flow rate, is not convincing. Increasing a fuel to air equivalents ratio in the gas mixture would be equivalent to decreasing the oxygen to fuel ratio, which would be obvious for the reasons presented in the preceding paragraph to prevent overheating of the reformer system.

Regarding claim 18, appellant's argument, that Nataraj et al. fail to teach or suggest repeating flowing the oxidant into the reformer and reducing the flow of the oxidant to form a periodic pattern, but that Nataraj et al. is silent on the flow pattern of oxidant, is not convincing, since it would be obvious to repeat flowing the oxidant into the reformer system and

reducing the flow of the oxidant to form a periodic flow pattern, for the reasons presented hereinbefore as to why it would be obvious to control the amount of oxygen to prevent overheating of the reformer system. One of ordinary skill in the art would appreciate from column 11, lines 40-51 of Nataraj et al. that if the flow of oxygen were reduced for too long a period, that the heat provided by exothermic reactions (1), (2) and (3) would be insufficient to provide the heat necessary to sustain endothermic reactions (4) and (5).

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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December 7, 2004

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